

***Oncophora melanocephala* (Nematoda, Camallanidae) from the chub mackerel, *Scomber japonicus* (Teleostei, Scombridae), caught off Madeira Island (Portugal)**

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Abstract

While investigating the nematode parasites of commercial fish caught off the coast of Madeira Island (Atlantic Ocean, Portugal), we collected five specimens of *Oncophora melanocephala* (Rudolphi, 1819) (Nematoda, Camallanidae) infecting the chub mackerel *Scomber japonicus* Houttuyn. This is the first record of *O. melanocephala* from chub mackerel and a new geographic record. Four additional larval specimens with developing buccal capsules were found in the chub mackerel examined.

Keywords

Camallanid nematodes, *Oncophora melanocephala*, fish, *Scomber japonicus*, Madeira Island

Introduction

The chub mackerel *Scomber japonicus* (Pisces, Scombridae) supports an important commercial fishery in Madeira Island, Portugal. This fish species has a widespread geographic distribution encompassing the Atlantic, Indian, and Pacific Oceans, as well as the adjacent seas (Collette and Nauen 1983). Previous authors have reported the occurrence of approximately 30 species of helminths in the visceral cavity, intestines, stomach, and gills of this fish (Costa *et al.* 2007, Oliva *et al.* 2008). Among the helminths parasitizing this fish species, anisakid nematodes are common and are represented by several species belonging to the genera *Anisakis* (Dujardin, 1845), *Hysterothylacium* (Ward et Magath, 1917), *Contracaecum* (Railliet et Henry, 1912), and *Raphidascaris* (Railliet et Henry, 1915).

During a survey of parasites of the chub mackerel caught off the coast of Madeira, we found a camallanid nematode provisionally assigned to the genus *Oncophora* (Diesing, 1851) (Nematoda, Camallanidae) (see Oliva *et al.* 2008). Camallanid nematodes are gastrointestinal parasites of fishes and other aquatic vertebrates (Rigby 1999). Transmission to the definitive host can be accomplished in two ways: (1) directly, through infected copepods or other crustaceans infected with the third larval stage or (2) through the ingestion of planktivorous fish, which accumulate nematode larvae, thereby acting

as paratenic hosts, in which the larvae can reach the fourth stage (Anderson 2000). Four genera of camallanids are known from marine fishes, namely *Oncophora*, *Camallanus* (Railliet et Henry, 1915), *Spirocamallanus* (Olsen, 1952) and *Procamallanus* (Baylis, 1923) (Vicente and Santos 1972, Rigby 1999). In the present study, we provide evidence that the camallanid found in chub mackerel caught off the coast of Madeira Island belongs to the species *Oncophora melanocephala*, based on light and scanning electron microscopy observations.

Materials and methods

One hundred and fifty one chub mackerel, *Scomber japonicus*, caught off the coast of Madeira Island, Atlantic Ocean (33°7'30"–32°22'20"N and 16°16'30"–17°16'38"W) were purchased at the local fish market, from November 2004 to March 2005. After capture by fishermen, all fish were placed on ice until dissection. Fish ranged in length (total length) from 23 to 40 cm. Fish were dissected and examined for the presence of nematodes in the visceral cavity and digestive tract, under a Zeiss Stemi 2000 C stereomicroscope, equipped with a Sony digital camera. Recovered nematodes were fixed in hot 70% ethanol, cleared in lactophenol, and mounted in glycerol jelly (Berland 2005). Morphological study and identification was

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performed using a Zeiss Axioplan Photomicroscope, equipped with DIC optics and a MC-80 camera. Measurements of morphological features were made with the aid of an ocular micrometer. Prevalence, intensity and abundance were calculated following Bush *et al.* (1997). Two individual *Oncophora melanocephala* were post fixed in 1% osmium tetroxide, dehydrated in graded ethanol series, critical point dried (JEOL JFC 1100) coated with gold-palladium (SPI sputter coater) and examined with a JEOL JSM-6301F scanning electron microscope (SEM).

Results

Five nematodes were found in the body cavity of the chub mackerel examined. The worms were fusiform in shape. When fresh, the worms were white in colour, except for the buccal capsule, which was dark brown. Males were 8.06–9.62 mm long ($n = 2$) and juvenile females were 12.06–14.09 mm long ($n = 2$). The buccal capsule was composed of four prominent parts, as follows: (1) two lateral valves, (2) two dorso-ventral tridents, (3) a basal ring, and (4) a colourless sclerotized cup connecting basal ring to oesophagus (Fig. 1). The tridents extended well past the posterior end of the buccal capsule (Fig. 1). Tridents were 150 μm in total length (i.e., from base to dis-

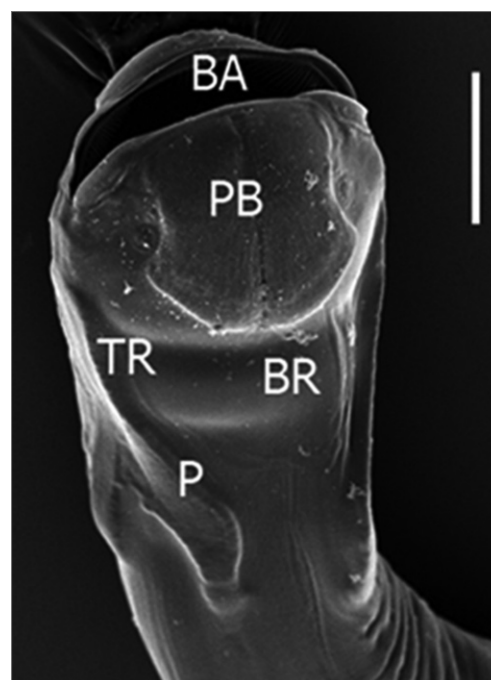


Fig 2. SEM micrograph of cephalic end of *Oncophora melanocephala* showing peribuccal shields (PB), basal ring (BR), tridents (TR) with prongs (P) and slit-like buccal aperture (BA). Scale bar = 50 μm

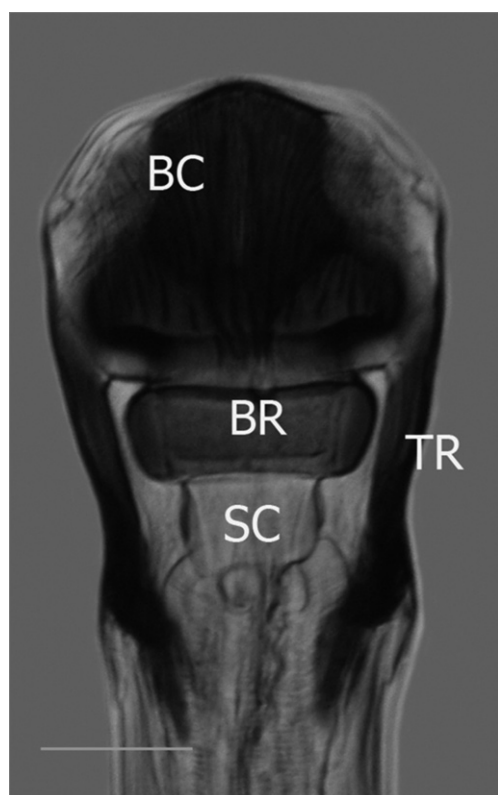


Fig 1. SEM micrograph of lateral view of cephalic extremity of *Oncophora melanocephala* from *Scomber japonicus*, showing the buccal capsule (BC), basal ring (BR), sclerotized cup (SC) and tridents (TR). Scale bar = 43 μm

tal end of prongs), with lateral prongs measuring 70 μm in length and the central prong measuring 63 μm . In one female, the two laterals were 63 μm , and the central prong was 75 μm long, while in two males, the lateral prongs 56 μm and the central prong was 73.5 μm long. The mouth was a slit-like opening between the two valves of the buccal capsule, each bearing two rounded cephalic papillae (Fig. 2). The buccal capsule had about 28 ridges at the anterior margin in males ($n = 1$) and 38 in females ($n = 1$), with the number of ridges decreasing posteriorly. The buccal capsule ridges are readily visible using SEM through the open mouth of the worm (Fig. 3). Two peribuccal shields were observed on the anterior end of each valve, extending at least two-thirds of the length of the buccal capsule (Fig. 2). The muscular oesophagus was 980–1110 μm in males ($n = 2$) and 1120–1320 μm in females ($n = 2$), while the glandular oesophagus measured 960–1040 μm in males ($n = 2$) and 1110–1310 μm in females ($n = 2$). Males had 7 pairs of preanal and five pairs of postanal caudal papillae. The length of the larger spicule was 554 μm ($n = 1$). The male tail was conical in shape, measuring 53.3 μm ($n = 1$), and without papilla-like protrusions at the posterior extremity. The female vulva protruded and the opening was characterized by elevated and darkened folding. Female tail was conical, measuring 200 μm long ($n = 1$) with 2 visible minute papilla-like protrusions at the posterior extremity. Based on the characteristic morphological features of the buccal capsule, morphology of the tridents, and the number and disposition of male caudal papillae, we identify our specimens from the chub mackerel off the coast of Madeira Island as *Oncophora melanocephala*. The

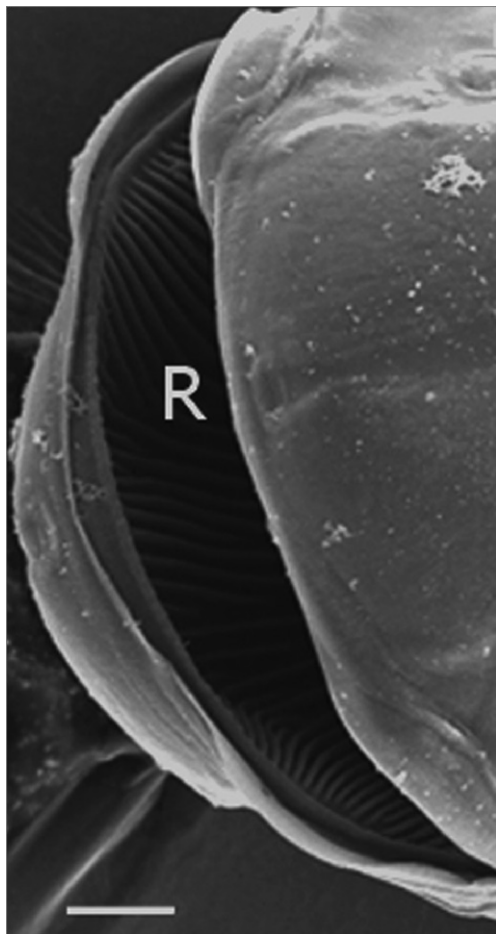


Fig 3. SEM micrograph of lateral view of *Oncophora melanocephala* showing mouth opening with inner ridges (R). Scale bar = 10 µm

prevalence of *O. melanocephala* in chub mackerel was 3.3% (n = 151). Mean intensity and mean abundance values were low at 1.64 and 0.12, respectively.

Discussion

Apparently, *Oncophora melanocephala* is the only species of the genus described to date (Moravec *et al.* 1999). Its distribution includes the Atlantic Ocean, Gulf of Mexico and the Mediterranean. This camallanid nematode has previously been reported from the following marine fish:

Northwestern Atlantic: Sword fish, *Xiphias gladius* Linnaeus (Hogans *et al.* 1983, Bunkley-Williams and Williams 1996, Castro-Pamplón *et al.* 2002).

“North Sea and Mediterranean” (Bunkley-Williams and Williams 1996): Atlantic mackerel, *Scomber scombrus* Linnaeus; Atlantic bonito, *Sarda sarda* Bloch; bluefin, *Auxis rochei rochei* (Risso); frigate tuna, *Auxis thazard* Lacepède; bluefin tuna, *Thunnus thynnus* Linnaeus.

Mediterranean: Various Scombridae as *Cucullanus melanocephalus*, synonym *Trichocephalus gibbosus* (Rudolphi,

1819); bluefin tuna, *Thunnus thynnus* Linnaeus (Mladineo 2006a, b; Nowak *et al.* 2006; Mladineo *et al.* 2008); sword fish, *Xiphias gladius* Linnaeus (Damiano *et al.* 2006).

Gulf of Mexico: Atlantic blue marlin, *Makaira nigricans* Lacepède (Bunkley-Williams and Williams 1996); yellowfin tuna, *Thunnus albacares* Bonnaterre (Bunkley-Williams and Williams 1996); queen snapper, *Etelis oculatus* Valenciennes (Rodriguez 2004).

Gulf of Guinea: Albacore (yellowfin) tuna, *Thunnus albacares* Bonnaterre (Baudin-Laurencin 1971, 1972); males were described as *O. albacarensis* (Baudin-Laurencin 1972).

Brazil: Atlantic big-eye, *Priacanthus arenatus* Cuvier (Pinto *et al.* 1988, Tavares *et al.* 2001); tuna (*Thunnus thynnus*, *T. albacares*, *T. atlanticus*, *Auxis thazard*) (Moravec *et al.* 1999); Atlantic bonito, *Sarda sarda* (Bloch) (Alves and Luque 2006).

Moreover, Rigby (1999) considers that the species *Camallanus aotea* Slankis et Korotaeva, 1974, should be transferred to the genus *Oncophora*, thus extending the geographic range of *Oncophora* to the Pacific. Moravec *et al.* (1999) concurred that *C. aotea* bears a strong resemblance to *O. melanocephala* but stated that *C. aotea* should be re-examined before being transferred to *Oncophora*. However, type specimens are not available.

In our specimens, we observed 28 to 38 buccal capsule ridges, which is much greater than the 22 ridges reported by Moravec *et al.* (1999). Although Petter (1979) stated that the number of buccal capsule ridges in the genus *Camallanus* may indicate evolutionary affinities, Rigby and co-authors have reported that the number of ridges depends on the position of the capsule where the ridges were counted in *Camallanus* and other Camallaninae (Rigby *et al.* 1998, 2008; Sharma *et al.* 2002). As reported above, the number of buccal capsule ridges, in our specimens of *O. melanocephala*, were greatest at the anterior margin and decreased posteriorly.

Our specimens from chub mackerel were smaller than those described by Moravec *et al.* (1999) from tuna. Moreover, females did not show the enlargement of the body at its posterior part as seen in Moravec *et al.* (1999), a characteristic of gravid females of this genus. Most likely, our specimens were juvenile specimens not yet fully grown and will become fully developed in a later phase.

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